63. The method of claim 16, wherein said previously existing objects comprise works of art.

REMARKS

Claims 1-61 were presented for examination, are pending and are rejected. Reconsideration is respectfully requested.

Attached Declaration

Please see the attached Declaration, incorporated herein by reference. The numbered comments in the Declaration directly correlate to the item numbers provided by the Examiner in the Office Action mailed June 19, 2002, to which this Amendment is responsive.

Drawings:

The drawings are objected to because it is not clear which part(s) of the dime 16 in Fig.1 the labels 10, 12 and 14 are referring to.

A proposed drawing correction is attached in response to the Examiner's objection. Therefore the objection should be withdrawn.

Specification:

The disclosure is objected to because of informalities. The disclosure has been amended to correct the informalities.

On page 5, lines 14, the phrase "1 MeV γs" has been amended to state: "photons of 1 MeV energy, hereinafter referred to as 1 MeV γs".

On page 9, line 11, the number "3048" has been replaced with the number "3072".

On page 15, lines 4-7, the sentence beginning with the word "Modern" has been amended to recite: "Modern strip gamma-ray detectors or Compton gamma-ray imaging detectors".

Therefore the objection should be withdrawn.

The Examiner requires that the specification be revised in order to comply with 35 U.S.C. 112, first paragraph to correct terms that are not clear, concise and exact.

The sentence beginning on page 7, line 5 has been amended to clarify its wording. Further, this amendment obviates the objection to the use of the phrase "e.g., ±1-4%, when attempting to "tell time" to 3-12% relative accuracy" because such phrase has been deleted.

The sentence beginning on page 9, line 1 has been amended to clarify that the number "3" is recited to provide a statistically accurate estimate. It is well known in the art to use 3 standard deviations about the true value to arrive at a statistically reliable estimate of the true value.

Referring to page 9, line 7, the examiner argues that the requirement "the line-strength must be read out to 1 part in 2^N" is not imposed on the reading of instantaneous counts, as implicated, but must be on the result of time-zeroed activity calculated back from the instantaneous count reading over the age of the sample since creation, which has been previously determined with, e.g., a 3-12% statistical error. The objection is respectfully traversed.

As discussed in the attached Declaration, the information provided is sufficient to teach how to practice the invention.

The sentence beginning on page 10, line 13, has been amended in the manner suggested by the Examiner.

The Examiner argues that the specification fails to provide information whether or not "modern strip gamma-ray detectors" have the same spectral capability as high-sensitivity and high-energy resolution gamma detector. The objection is respectfully traversed. As discussed above, the sentence beginning on page 14, line 22, has been amended to state "Modern strip gamma-ray detectors or Compton gamma-ray imaging detectors can be used to identify the 2D-logo pattern of gamma-ray watermarks, thereby increasing the "uniqueness" of the watermarks to far higher levels."

The Examiner argues that the feasibility of the neutron activation technique described on page 16, lines 6-21 is not adequately described. The objection is respectfully traversed. See the attached Declaration, which states "Contrary to the Examiner's objections, neutron activation poses no significant statistical impediments to the teaching of the invention as it stands, simply because very large numbers of neutrons are employed in any such activation and, as also stated above, billions of nuclei are typically activated in any single GW (so that statistical fluctuations in the numbers of nuclei so activated in each GW are below 0.01%)." Therefore the objection should be withdrawn.

Therefore the objections should be withdrawn.

The Brief Description of the Drawings is objected to by the Examiner. The descriptions of figures 1 and 2 have been amended to overcome the objection. Therefore the objection should be withdrawn.

Claim Objections:

Claims 29 and 34 are objected to under 37 CFR 1.75(c) as being in improper form. Claims 29 and 34 have been amended to remove the multiple dependencies. New claims 62 and 63 have been added to provide limitations to independent claim 13. Therefore the objection should be withdrawn.

The 35 U.S.C. 101 Rejections:

Claims 6 and 50 are rejected under 35 U.S.C. 101 because the Examiner asserts that the limitation: "at least one radioisotope of said at least two radioisotopes comprises radionuclides that are not practically detectable" is essentially inoperative. These claims have been amended to clarify the conditions under which the radionuclides are not detectable. Therefore the rejections should be withdrawn.

Claim 25 is rejected under 35 U.S.C. 101 because the Examiner asserts the limitations are directed to non-statutory subject matter. The rejection is respectfully traversed.

35 U.S.C. 101 permits patents to be granted for any new and useful process. Claim 25 is directed to a method for tagging any object with a tag of numeric information comprising information about the source, origin, ownership or history of said object. Therefore, claim 25 presents statutory subject matter. Therefore the rejections should be withdrawn.

The 35 U.S.C. 112 Second Paragraph Rejections:

Claims 6, 11, 16, 23, 28, 41, 44, 50, 55, 58 and 61 are rejected as being indefinite.

Claims 6 and 50 are rejected because it is well known in the art that detection of a narrow gamma line having an intensity much below the overall noise is very well possible by utilizing a spectrally resolving gamma detector to detect the narrow gamma

line. The rejection is respectfully traversed. Please see the attached Declaration. Therefore the rejections should be withdrawn.

Claims 10, 11, 54 and 55 are rejected because the Examiner asserts that they are self-contradictory.

Claim 10 has been amended to recite: "wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides which are carried on at least one bead of an ion-exchange or zeolite variety."

Claims 11 has been amended to recite: "wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides which are metered out from at least one solution-containing reservoir of an inkjet-type printing mechanism operating under algorithmic control."

Claim 54 has been amended to recite: "wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides which are carried on at least one bead selected from a group consisting of an ion-exchange bead and a zeolite bead."

Claim 55 has been amended to recite: "wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides which are metered out from at least one solution-containing reservoir of an inkjet-type printing mechanism operating under algorithmic control."

Therefore the rejections should be withdrawn.

Claim 16 is rejected because the Examiner asserts that the language of the claim would render the cartridge to be empty.

Claim 16 has been amended to remove the statement: "from which the ink has been removed".

Further regarding claim 16, the Examiner states that the limitation or step of removing the ink from the cartridge is not supported by the specification. The rejection is respectfully traversed. See for example, page 9, line 18, through page 10, line 1 of the specification, which states: "Various (e.g., 7) ink reservoirs in the ink cartridges of a single "photographic quality" color printer are loaded with radioisotopes in solution wherein one (1) radioisotope at precisely known concentration is loaded per reservoir." This statement makes it clear that the ink has been replaced with radioisotopes.

Therefore the rejections should be withdrawn.

Regarding claim 23, the Examiner indicates that an energy distribution cannot possibly be used to record any unique signature upon or within an object, but only to identify or characterize the object. The rejection is respectfully traversed.

Please see the attached Declaration. Further, the claim has been amended to delete "of" in the last line of the claim. Therefore the rejection should be withdrawn.

The Examiner rejects claim 19, stating the limitation that the signature logos are "visible to low energy gamma-ray watermark" is not understandable. Claim 19 has

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been amended to recite "detectable as" instead of "visible to". Therefore the rejection should be withdrawn.

Claim 28 is rejected as including limitations that cannot be given any patentable weight. Claim 28 has been deleted. Therefore the rejection should be withdrawn.

Claims 44 and 61 are rejected because the Examiner asserts that the wording of the claims is not understandable to one of ordinary skill in the art. Claims 44 and 61 have been corrected. Therefore the rejection should be withdrawn.

Claims 41 and 58 are rejected because the Examiner asserts that "the ratio .... is made equal" does not make any sense. Claims 41 and 58 have been corrected. Therefore the rejection should be withdrawn.

The 35 U.S.C. 102 Rejections:

Claims 1, 13 and 45 are rejected under 35 U.S.C. 102(b) and 102(e) as being anticipated by Kane et al. The rejection is respectfully traversed.

Please see the attached Declaration. Further, Kane et al. do not control the quantity of each radioisotope to produce a controlled ratio of quantities as recited in applicants' claims 1, 13 and 45. Kane et al. deposit a plurality of radioactive isotopes, and then measure the characteristic gamma spectral distribution and line intensities.

See col. 3, line 63 through col. 4, line 1 and col. 4, lines 26-33. The reference teaches away from knowing the amount of each isotope, which knowledge is crucial to being able to create a gamma-watermark whose digital information content can be reliably read-out by real instruments with the precision necessary to encode reliably multiple bits per spectral line. See column 7, lines 31-36, which states: "It is not necessary to know the absolute amount of each individual isotope in the plurality; what is significant is the ratio of the gamma lines (characteristic gamma energy intensity) in each gamma spectrum, at two different times." This is a very highly idealized statement, one far removed from the real world of gamma-ray spectrometers of acutely finite size and remarkably non-isotropic response, which however are the detectors addressed in the present invention. Therefore the rejection should be withdrawn.

Further, Kane et al. do not encode digital information. The examiner cites column 7, lines 39-41 as proving the reference discloses encoding digital information within the tag; however, the cited section merely states: "Isotope abundances are determined with a precision gamma spectrometer, a precise instrument utilizing a lithium-drifted germanium crystal as a detector, and the observed data is recorded digitally in a multi-channel pulse height analyzer." Therefore the rejection should be withdrawn.

Claims 2, 18, 41-43, 46 and 57-60 are rejected under 35 U.S.C. 102(b) and 102(e) as being anticipated by Kane et al. The rejection is respectfully traversed.

Please see the attached Declaration. Further, claims 2 and 41-44 depend from claim 1, which should be allowable over the reference as stated above. Therefore, the rejection of claims 2 and 41-44 should be withdrawn. Claim 18 depends from claim 13, which should be allowable over the reference as stated above. Therefore, the rejection of claim 18 should be withdrawn. Claims 46 and 57-60 depend from claim 45, which should be allowable over the reference as stated above. Therefore, the rejection of claims 46 and 57-60 should be withdrawn.

Further, the reference fails to teach the limitation in applicants' claim 41 and 58 that the ratio of the intensities of two gamma-ray-emitting transitions of two radioisotopes of different half-lives is made to be equal in the watermark, by convention, where at any later time, the then-observed ratio of line intensities of the transitions constitutes a 'clock' whose 'elapsed time-reading' may be determined as precisely as desired, simply by choosing how long to inspect the clock. Therefore the rejection of claims 41 and 58 should be withdrawn.

Further, the reference fails to teach the limitation of the applicants' claim 43 and 60 which recite that the tag comprises a signature that comprises a sequence of bits in a binary bit-string of dozens of bits in total length, and is encoded by fixing the ratio of the line-intensity of the gamma-radiation from a radioisotope to a reference line-intensity, translated back to the time of creation of the tag by use of the time interval encoded in said clock. Therefore the rejection of claims 43 and 60 should be withdrawn.

Claims 3, 4, 6-8, 10-12, 14-17, 19, 26, 27, 29-33, 35-40, 44, 47, 48, 50-52, 54-56 and 61 are rejected as being anticipated by Kane et al. The rejection is respectfully traversed.

The Examiner has presented the immediately above rejection as separate rejections spread out over pages 12-16 of the Office Action; however, the rejected claims have been grouped together as shown above to save space.

Please see the attached Declaration. Further, claims 3, 4, 6-8, 10-12, 29-33 and 44 depend from claim 1, and should therefore be allowable over the reference. Claims 14-17, 19 and 35-40 depend from claim 13 and should therefore be allowable. Claims 47, 48, 50-52, 54-56 and 61 depend from claim 45 and should therefore be allowable.

Claims 26 and 27 are rejected as being anticipated by Kane et al.; however, these claims depend from claim 23 which is not rejected as anticipated by Kane et al. Accordingly the rejection is improper and should be withdrawn.

The rejection of claim 3 is respectfully traversed. Please see the attached Declaration regarding the rejection of Claim 3. Therefore the rejection should be withdrawn.

Further, claims 7 and 51 are rejected as being anticipated by Kane et al. The rejection is respectfully traversed. The Examiner cites several sections from the reference in support of his position that "at least one radioisotope of said at least two radioisotopes comprises a radionuclide in a specified amount to encode the

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numerical content of a binary bit-string whose length is at least one bit". None of the cited sections actually provide support for the Examiner's rejection. The sections are provided below.

Column 6, lines 19-22 states: "Hence the amount of radioactivity disposed on or in an article is directly correlated to the purpose, function and desired time-frame for detection, identification, authentication and/or dating of that article."

Column 7, lines 6-16 states: "Use of a plurality of isotopes having a characteristic gamma spectrum can be employed in conjunction with documents or other articles to be protected for extended periods of time ranging to many years. In this situation, the plurality is adjusted to provide detection, identification, authentication and dating of a duration longer than may be necessary for articles such as mass produced items. These include, but are not limited to, .sup.51 Cr for detection and identification and .sup.139 Ce, together with .sup.22 Na, for authentication and dating purposes."

Column 7, lines 35-38 states: "Isotope abundances are determined with a precision gamma spectrometer, a precise instrument utilizing a lithium-drifted germanium crystal as a detector, and the observed data is recorded digitally in a multi-channel pulse height analyzer."

Column 7, lines 38-40 states: "The recorded spectrum, which is unique to a particular plurality at a specific time, can be resolved to obtain isotope abundance information by mathematical analysis of the spectral data."

There is no discussion in the cited sections, or anywhere in the patent, of providing a radionuclide in a specified amount to encode the numerical content of a binary bit-string whose length is at least one bit. Therefore the rejection of claims 7 and 51 should be withdrawn.

Claims 11, 14 and 55 are rejected as being anticipated by Kane et al. The rejection is respectfully traversed.

Claims 11 and 55 recite the limitation: "wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides, wherein said radionuclides are metered out from at least one solution-containing reservoir of an inkjet-type printing mechanism under algorithmic control." Claim 14 has been amended to recite "metered". The term "metered" is defined by the Merriam-Webster dictionary as: "to supply in a measured or regulated amount". It is not the automated dispensing of individual radioisotope-bearing solutions which is asserted to be novel by the present invention, but rather the quantitative dispensing of it made feasible by the digital character of highly-reproducible picoliter droplet dispensation by modern ink-jet printer cartridges. Therefore the rejection should be withdrawn.

Claim 33 is rejected as being anticipated by Kane et al. The rejection is respectfully traversed.

The examiner states: "Computer software by itself (claim 33) is an abstract idea that cannot possible be tagged." Claim 33 does not recite tagging computer software. Claim 33 recites: "wherein said things which are often counterfeited comprise media bearing computer software". Thus, it is the media which is claimed, not computer software. Therefore the rejection should be withdrawn.

The 35 U.S.C. 103(a) Rejections

Claims 5, 9, 49 and 53 are rejected as being unpatentable over Kane et al as applied to claims 1 and 45 above, and further in view of Monastra et al. The rejection is respectfully traversed.

Arguments and evidence why the rejected claims should be allowable over the references are presented in the attached Declaration. Regarding claims 5 and 49, the Examiner states: "Kane et al. disclose all the limitations of claims 5 and 49 as applied to the respective base claims 1 and 45 above, except the limitation of encoding some redundancy in the digital bit-string representation of the tag." The applicants respectfully disagree. Kane et al. do not show a tag that comprises a digital bit-string representation. Further, there is no teaching or suggestion in Kane et al. to produce a tag that comprises a digital bit-string representation encoded with some redundancy. Further still, Monastra et al. is directed to reliability improvements in switched communications, and as such, is a completely non-analogous art. Claim 9 depends from claim 5 and claim 53 depends from claim 49. Further, claims 5 and 9 depend from claim 1, which should be allowable over Kane et al. as discussed above, and claims 49

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and 53 depend from claim 45 as discussed above. Therefore the rejection should be withdrawn.

Claims 20-22 are rejected as being unpatentable over Kane et al as applied to the parent/base claims 19 and 13 above, and further in view of Guilberg et al. The rejection is respectfully traversed.

Please see the attached Declaration. Further, claims 20-22 should be allowable over Kane et al. because they depend from claim 13, as discussed above. Therefore the rejection should be withdrawn.

Claims 23 and 24 are rejected as being unpatentable over Kane et al. as applied to the parent/base claims 23 above, and further in view of Myron. The rejection is respectfully traversed. Please see the attached Declaration. Therefore the rejection should be withdrawn.
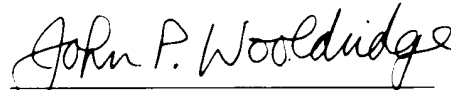
Conclusions

It is submitted that this application is in condition for allowance based on claims 1-63 view of the amendments thereto and the foregoing comments.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version With Markings To Show Changes Made."

If any impediments remain to prompt allowance of the case, please contact the undersigned at 925-292-8652.

Respectfully submitted,

John P. Wooldridge
Attorney for Applicant
Registration No. 38,725

Dated: December 18, 2002

In the Specification:

The sentence that begins on page 5, line 13, has been amended, which sentence begins with the word "Since" as follows: --Since the mass absorption coefficient of light elements such as carbon, nitrogen, oxygen, magnesium, aluminum and silicon for [1 MeV γs] photons of 1 MeV energy, hereinafter referred to as 1 MeV γs, is ≤ 0.04 cm^2/g, the transport mean free path for such MeV-energy gamma-rays in all such materials is 25 g/cm^2, e.g., 25 cm in 1 gm/cc material.--

On page 9, line 13, please replace the number "3048" with the number --3072--.

The sentence that begins on page 14, line 22, has been amended, which sentence begins with the word "Modern" as follows: --Modern strip gamma-ray detectors [with as well as] or Compton gamma-ray imaging detectors can be used to identify the 2D-logo pattern of gamma-ray watermarks, thereby increasing the "uniqueness" of the watermarks to far higher levels.--

The sentence that begins on page 7, line 5, has been amended, which sentence begins with the word "At" as follows: --At any later time, the then-observed ratio of the line-intensities, which may be determined as precisely as desired by increasing the counting interval, from these two (or more) transitions of known half-life constitutes a

'clock' from which [an] 'elapsed time' [reading may be determined as precisely as desired (e.g., ±1-4%, when attempting to "tell time" to 3-12% relative accuracy)] can be traced back.--

The sentence beginning on page 9, line 1, has been amended, which sentence begins with the word "If" as follows: --If a binary bit-string of information is to be encoded N bits per radioisotope, i.e., as a binary-fraction specifying the intensity of a given spectral line emitted by a single radioisotope comprising a portion of the radiological inventory of a gamma watermark, then ~3 x $(2^N)^2$ gamma-ray counts of that spectral line need to be recorded, in order to have a statistically reliable estimate of the relative intensity [to the required precision] which is statistically reliable at the level of three standard deviations about the true mean value.--

The sentence beginning on page 10, line 13, has been amended, which sentence begins with the phrase "The above steps" as follows: --The above steps might be repeated until, for instance, 1,000 spatially separated watermarks have been so written, with each watermark thus having a distinct (typically, unique) computer program-controlled digital content.--

On page 11, line 10, "that" has been deleted and --the-- has been inserted.

On page 11, line 12, the word --the— has been inserted between "shows" and "spectral".

In the claims:

Claim 28 has been deleted.

Claims 6, 10, 11, 14, 16, 19, 23, 29, 34, 41, 44, 50, 54, 55, 58 and 61 have been amended as follows:

6. (Amended) The method of Claim 1, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides that are not [practically] detectable with standard types of field survey radiation-detection instruments in the pertinent environment of said tag.

10. (Amended) The method of Claim 1, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides[, wherein said radionuclides] which are carried on at least one bead of an ion-exchange or zeolite variety.

11. (Amended) The method of Claim 1, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides[, wherein said radionuclides] which are metered out from at least one solution-containing reservoir of an inkjet-type printing mechanism operating under algorithmic control.

14. (Amended) The method of Claim 13, wherein each radioisotope is [deposited] metered on said object or upon a tag to be affixed to said object using ink-jet printer technology.

16. (Amended) The method of Claim 14, wherein each said radioisotope is delivered from an ink-jet printer cartridge [from which the ink has been removed] to produce low level radioactive tags incorporated invisibly onto previously existing objects.

19. (Amended) The method of Claim 13, further comprising creating two dimensional signature logos [visible to] detectable as low energy gamma-ray watermarks.

23. (Amended) A method for identifying an object, wherein said method comprises directing a high-energy radioactive ion beam at said object, wherein an energy distribution is induced upon said ion beam by said object, wherein said energy distribution is used to record [of] a unique signature upon or within said object.

29. (Amended) The [methods] method of claim 10 [or of claim 15], further comprising incorporating low-level radioactive tags into a label.

34. (Amended) The [methods] method of claim 10 [or of claim 16], wherein said previously existing objects comprise works of art.

41. (Amended) The method of claim 2, wherein at least two radioisotopes are employed to encode said time-of-creation of said tag, wherein the ratio of the intensities of two gamma-ray-emitting transitions of two radioisotopes of different half-lives is made to be equal to unity in said watermark, [by] as a time-originating convention, wherein at any later time, the then-observed ratio of line intensities of said transitions constitutes a 'clock' whose 'elapsed time-reading' may be determined as precisely as desired, simply by choosing how long to inspect the clock.

44. (Amended) The method of claim 43, [wherein said signature comprises code blocks, wherein the ordering of said code blocks to constitute the total digital signature is, from highest order to lowest order bit in the signature, that bit-string decoded from the relative amplitude of lowest-energy gamma-ray spectral line, and then other code blocks sequentially in order of increasing originating gamma-ray spectral energy, all the way up to the code block arising from the highest energy line] wherein said signature comprises at least two code blocks, wherein the ordering of said code blocks constitute the total digital signature and wherein the ordering of said code blocks is, from highest order bit to lowest order bit in the

signature, that bit-string decoded from the lowest-spectral-energy gamma-ray line, with the other code blocks being decoded sequentially in order of increasing gamma-ray spectral-energy, one block per gamma-ray line, up to the code block corresponding to the highest-spectral-energy gamma-ray line comprising the gamma-ray watermark.

50. (Amended) The gamma watermark of Claim 45, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides that are not [practically] detectable with standard types of field survey radiation-detection instruments in the pertinent environment of said tag.

54. (Amended) The gamma watermark of Claim 45, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides[, wherein said radionuclides] which are carried on at least one bead selected from a group consisting of an ion-exchange bead and a zeolite bead.

55. (Amended) The gamma watermark of Claim 45, wherein at least one radioisotope of said at least two radioisotopes comprises radionuclides[, wherein said radionuclides] which are metered out from at least one solution-containing reservoir of an inkjet-type printing mechanism operated under algorithmic control.

58. (Amended) The gamma watermark of Claim 45, wherein said at least two radioisotopes [are] encode the time-of-creation of said tag and comprises different half-lives, wherein the ratio of the intensities of two gamma-ray-emitting transitions of said at least two radioisotopes is made to be equal to unity in said tag, [by] as a time-originating convention, wherein at any later time, the then-observed ratio of line intensities of said transitions constitutes a 'clock' whose 'elapsed time-reading' may be determined as precisely as desired, simply by choosing how long to inspect the clock.

61. (Amended) The gamma watermark of claim 60, [wherein said signature comprises code blocks, wherein the ordering of said code blocks to constitute the total digital signature is, from highest order to lowest order bit in the signature, that bit-string decoded from the relative amplitude of lowest-energy gamma-ray spectral line, and then other code blocks sequentially in order of increasing originating gamma-ray spectral energy, all the way up to the code block arising from the highest energy line] wherein said signature comprises at least two code blocks, wherein the ordering of said code blocks constitute the total digital signature and wherein the ordering of said code blocks is, from highest order bit to lowest order bit in the signature, that bit-string decoded from the lowest-spectral-energy gamma-ray line, with the other code blocks being decoded sequentially in order of increasing gamma-ray spectral-energy, one block per gamma-ray line, up to

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the code block corresponding to the highest-spectral-energy gamma-ray line comprising the gamma-ray watermark.

The following new claims have been added:

62. The method of claim 15, further comprising incorporating low-level radioactive tags into a label.

63. The method of claim 16, wherein said previously existing objects comprise works of art.